

Fuel cat fines - problems and mitigation

Paul Hill

Chief Surveyor, Western Europe,
Braemar (inc The Salvage Association)

John L. David

Marine Investigator + Consultant,
Marine Professionals



The Rise in Claims Attributed to Cat Fines in Bunker Fuel



What can be done about it?

Paul Hill

Braemar SA

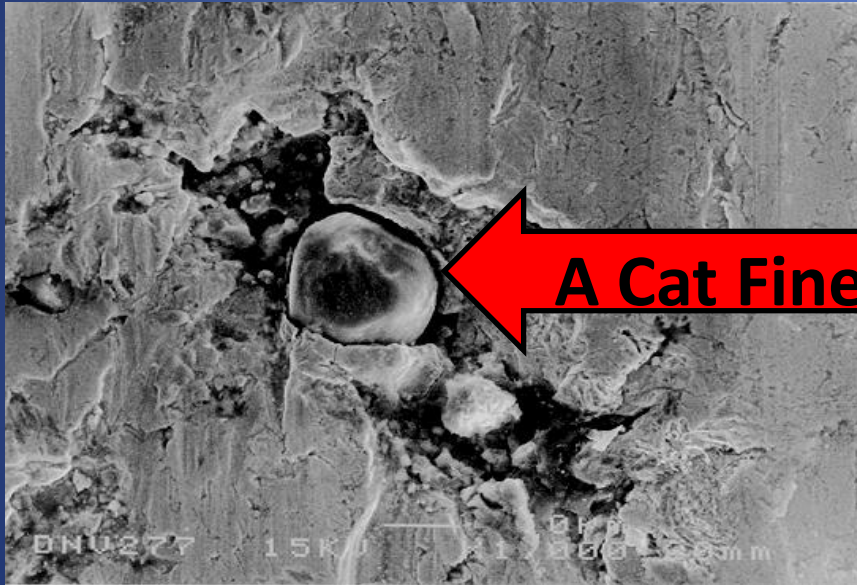
&

Capt. John L. David

Marine Professionals



What we will discuss today





Price of supply chain management

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Distinguishing between interruptions and exceptions

... Page 9



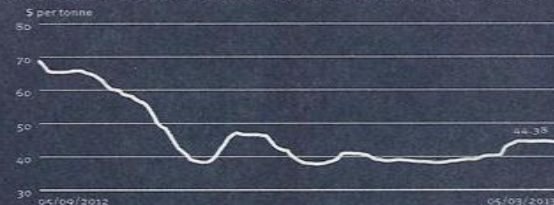
Pressure mounts on US to lift gas restrictions

... Back

Lloyd's List

lloydslist.com | No. 60,876 | Wednesday March 6th, 2013
Leading maritime commerce since 1734

BALTIC EXCHANGE'S LPG FREIGHT RATE, PREVIOUS SIX MONTHS



Source: Baltic Exchange

Catalyst fines drive growth in claims for engine damage

Commercial pressures and demand for low-sulphur fuel add up to \$1m headache

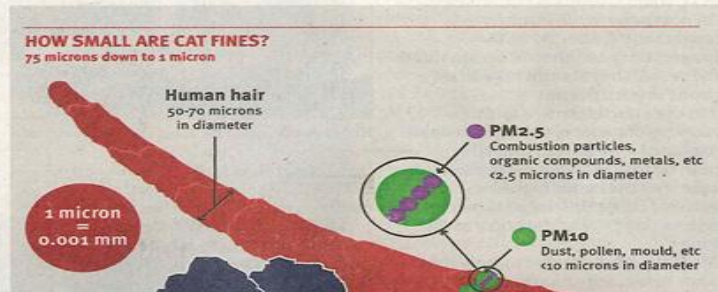
LIZ McMAHON

THERE has been a spike in cases of engine damage caused by catalyst fines as a result of commercial pressure and the ever-increasing demand for low-sulphur fuel, according to Braemar marine

equipment, and the method of cylinder liner lubrication, which washes the walls of the cylinders with more frequency, lessening the chance of cat fines being embedded."

Mr Hill said that cat fines were not necessarily a new problem as they had existed in fuel oil since the 1950s, when diesel engines were made to burn this type of fuel instead of the more expensive diesel and gas oil distillate fuels.

"Back in the late 1950s and 1960s, fuel was relatively cheap so the refineries were not interested in



NEWS HIGHLIGHTS

UK cruise passengers grow
UK passenger embarkations increased 10%, with 78,000 extra British and 6,000 additional overseas passengers, according to the Passenger Shipping Association.

Carriers discuss round-trips
Container lines operating in the transpacific trades will have the opportunity to discuss round-trip economics for the first time when the two existing carrier groups become a single entity next month.

Emma Maersk docks at Palermo
Maersk Line's flagship *Emma Maersk* is alongside at Fincantieri Palermo facilities and work is about to begin on pumping floodwater out of the engine room.



What are Cat Fines?

Catalytic Fines (from here on known as Cat Fines)

- **Hard Ceramic Compounds of Aluminium and Silicon,**
- **Used as a catalyst in the crude oil refining process,**
- **To enable higher yield of distillate fuels to be extracted from the stock**
- **The process is called catalytic cracking.**

The cat fines are expensive and are mostly recovered and used again, however small quantities may be carried over with the residual fuel

How big are Cat Fines?

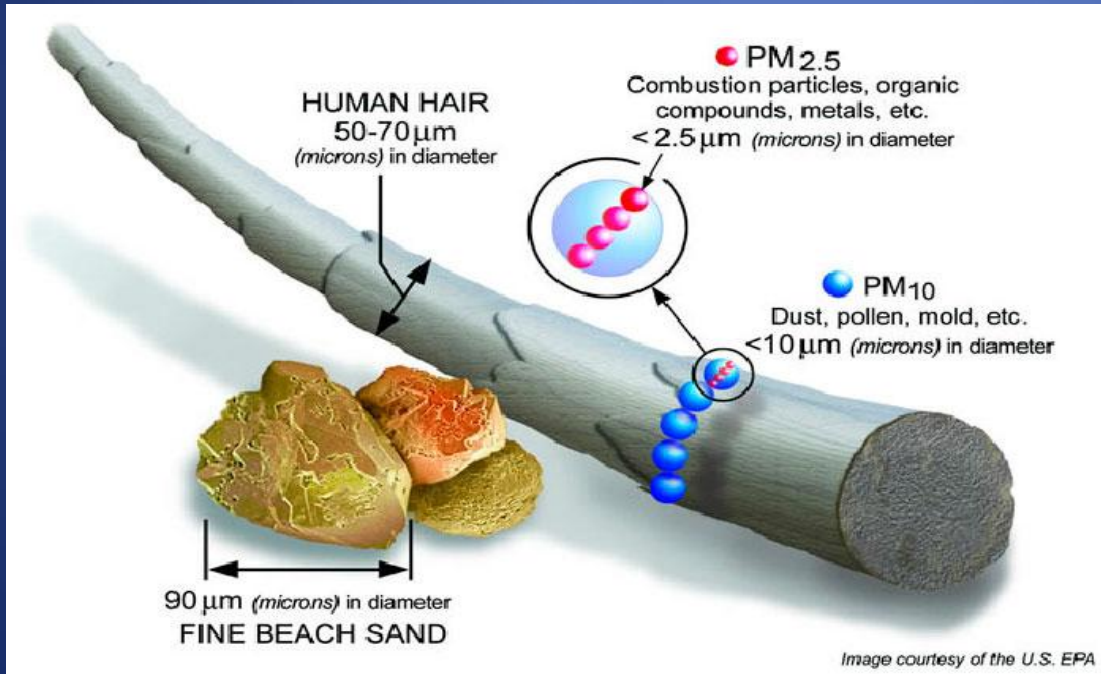
Cat Fines
embedded in a
fuel filter



How small are Cat Fines?

75 μm down to 1 μm

1 μm (micron)
= 0.001 mm



What do Cat Fines do?

They get embedded into engine components and cause abrasive wear

- The main components affected are cylinder liners and piston rings
- Can affect fuel pumps, injectors and valves
- In extreme cases piston rods and stuffing boxes



Are all engines at risk?

Cat fine damage mainly occurs in large slow speed main engines: Why?

- The larger fuel injection components allow sizeable cat fine particles into the cylinders
- Cylinder lubricating oil is minimally applied to the liner surface, and doesn't wash cat fines away

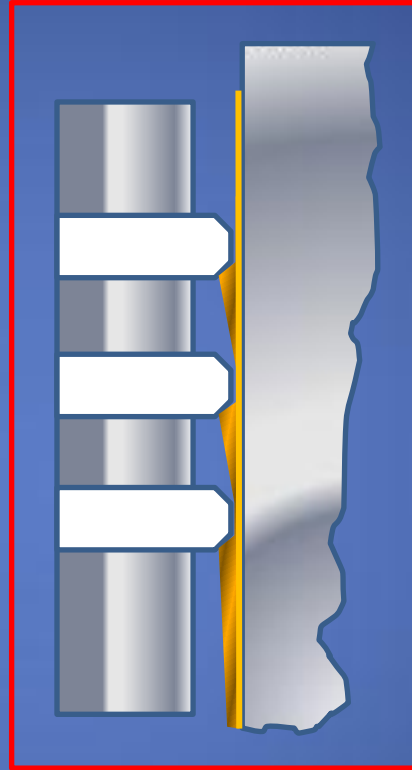
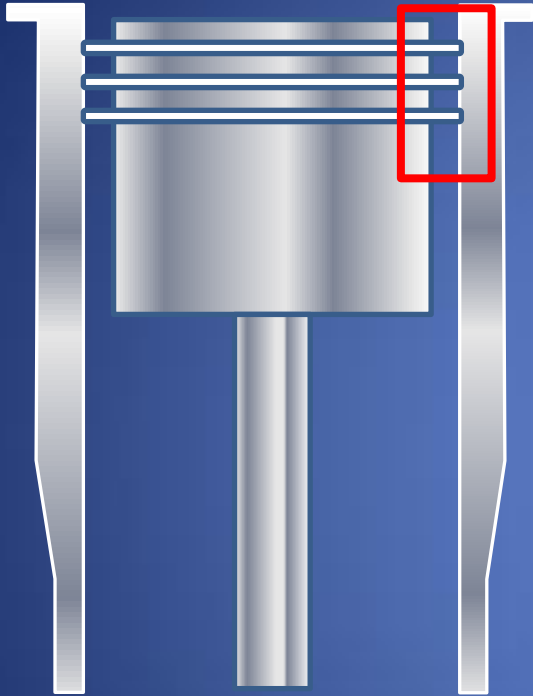
Less probable to find cat fine damage to medium and high speed engines: Why?

- More copious splash lubrication of cylinder liners can wash away cat fine particles
- Closer tolerance of components prevents ingress of larger particles



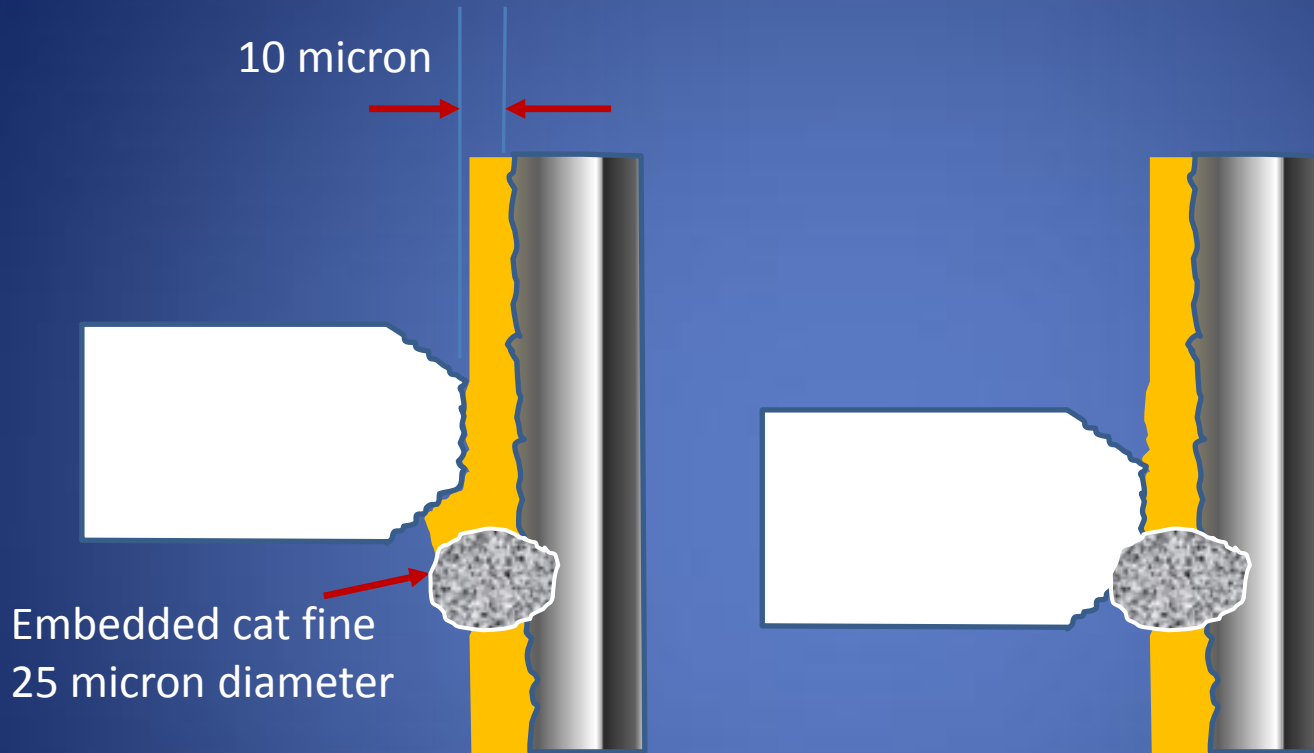
Why are cylinder liners vulnerable to cat fines?





Close up view of the cylinder oil
lubrication of the liner





The effect of cat fines embedded in the liner are shown here

Are Cat Fines a New Problem?

The answer to this is simply NO

- Up until the 1950's residual fuel oil was burnt in boilers, to create steam for turbines, the most common form of marine engine at the time.
- Large slow speed diesel engines slowly became popular in the 1960's and 70's as the ability to burn residual fuels improved.
- 1973 Middle East War tripled the price of crude oil, refiners forced to squeeze more product from the crude stock.
- Catalytic Cracking processes developed
- 1980's engine problems attributed to these Cat Fines started to be reported.

Early Warnings!

B&W Marine Service

Spare Parts & Technical Service

B&W

2 Torvegade
DK-1429 Copenhagen K
Telephone 33945-1-5425 01
Telex: Spare Parts 31157 swpsr dk
Technical Service 31151 swserv dk
Purchasing 31155 swpurc dk
Forwarding 19123 — 18042 bwtraw 1
Telegrams BWMARINE SERVICE

Division of B&W Motor A/S
Fos. No. 44767-1118
Evertsholm 2, Walm Group
Founded 1843

Service Letter

Current

no. SL 77-117/EE

Date October, 1977

Fuel Oil Cleaning Procedure Separator, Filter, and Homogenizer

Dear Sirs,

In recent years, the generally well-established procedure of centrifuging the fuel oil to remove water and solid particles, has, in a number of ships, tentatively been replaced by filtering and in some cases by homogenizing the oil, generally combined with filtering.

While the first modern filtering plants, which we have followed since 1968, seemed to give acceptable results, this was, however, not the case with bulk results from later installations, as cylinder wear rates in these generally rose to about 3 times the conventional figures or even more.

This increase in wear was confirmed by the fact that piston rings in ships with filter installations usually show a characteristic vertically-scratched running face, very rough on the upper rings and decreasing in roughness downwards.

This observation indicates that abrasive particles in these plants are introduced into the combustion chamber together with the fuel oil.

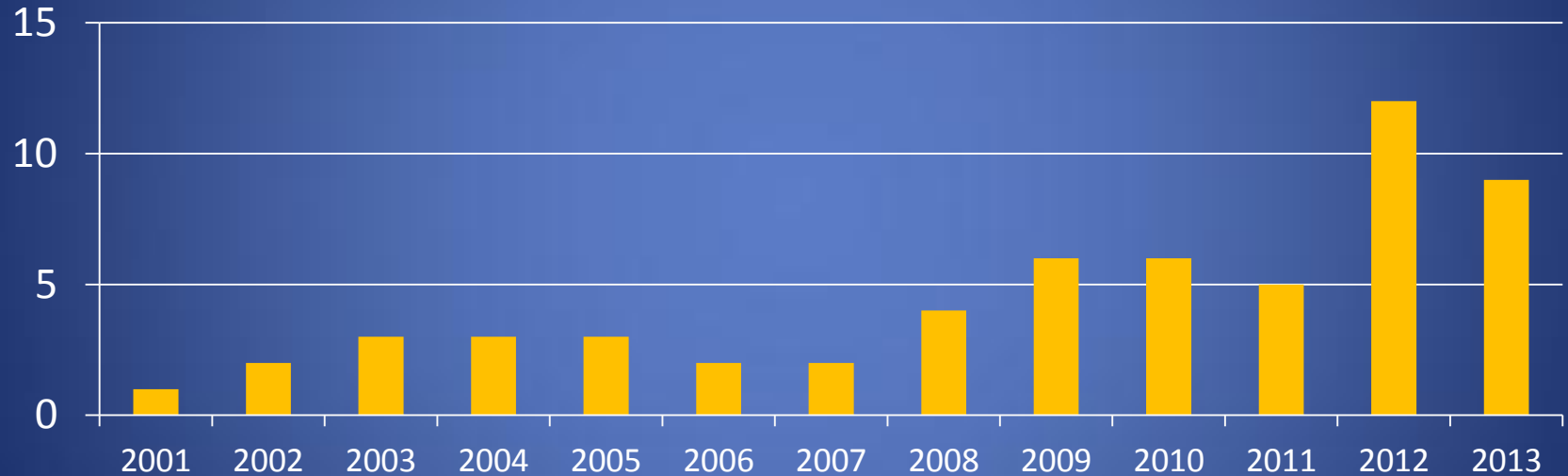
The fact that the fuel pumps in such cases do not always show abnormal wear, as could be expected, is most likely due to the clearance between the plunger and liner in the fuel pumps being too small to accept the abrasive particles, which are, therefore, scraped off by the upper edge of the plunger.



Cat Fine Engine Damage Cases

surveyed by Braemar SA

No. Of Cases



Why The Recent Rise in Cat Fine Claims ?

Environmental Legislation Demands:

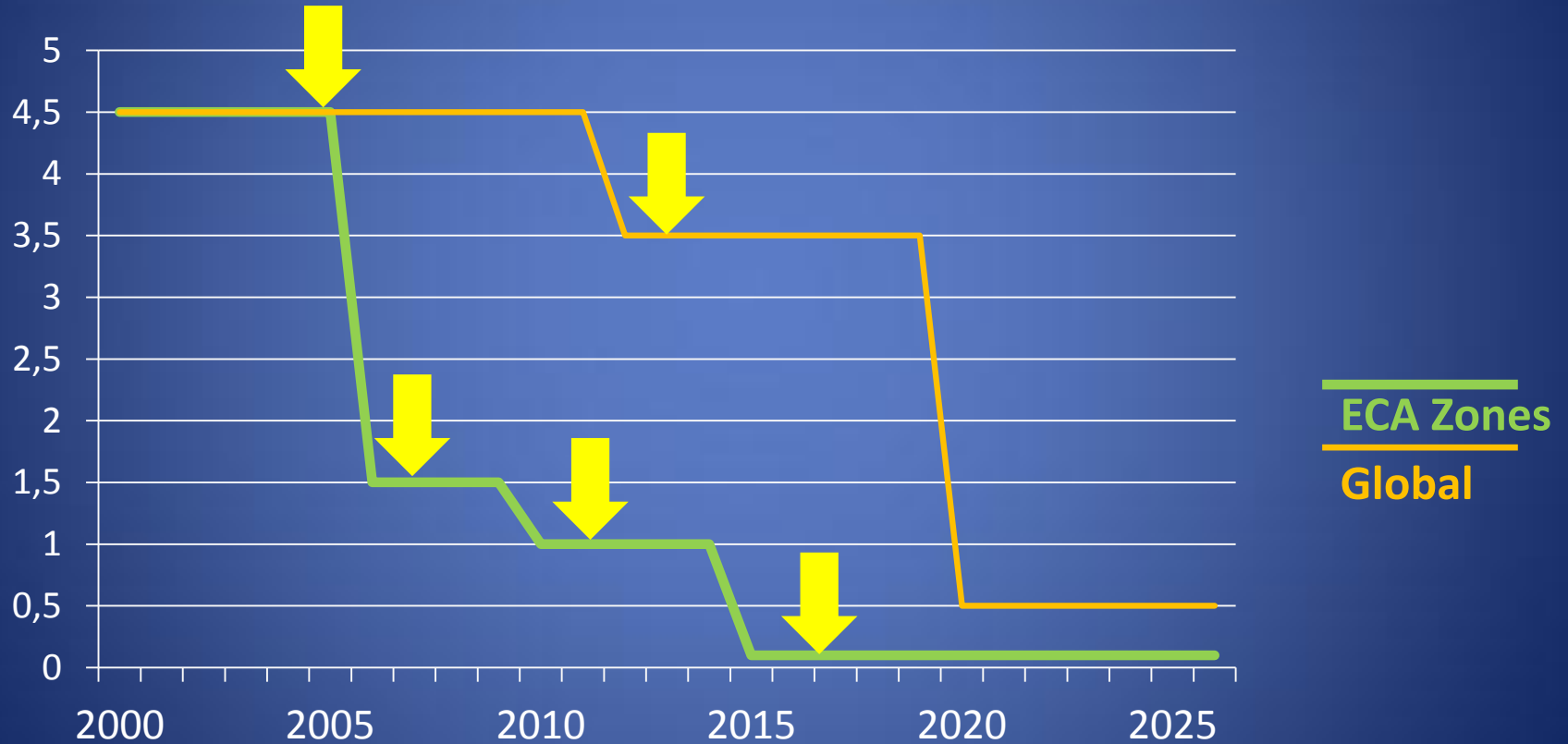
- Sulphur Emission Control Areas (ECAs)

Commercial Demands:

- Cheaper fuels



Marine Sulphur Limits



Emission Control Areas



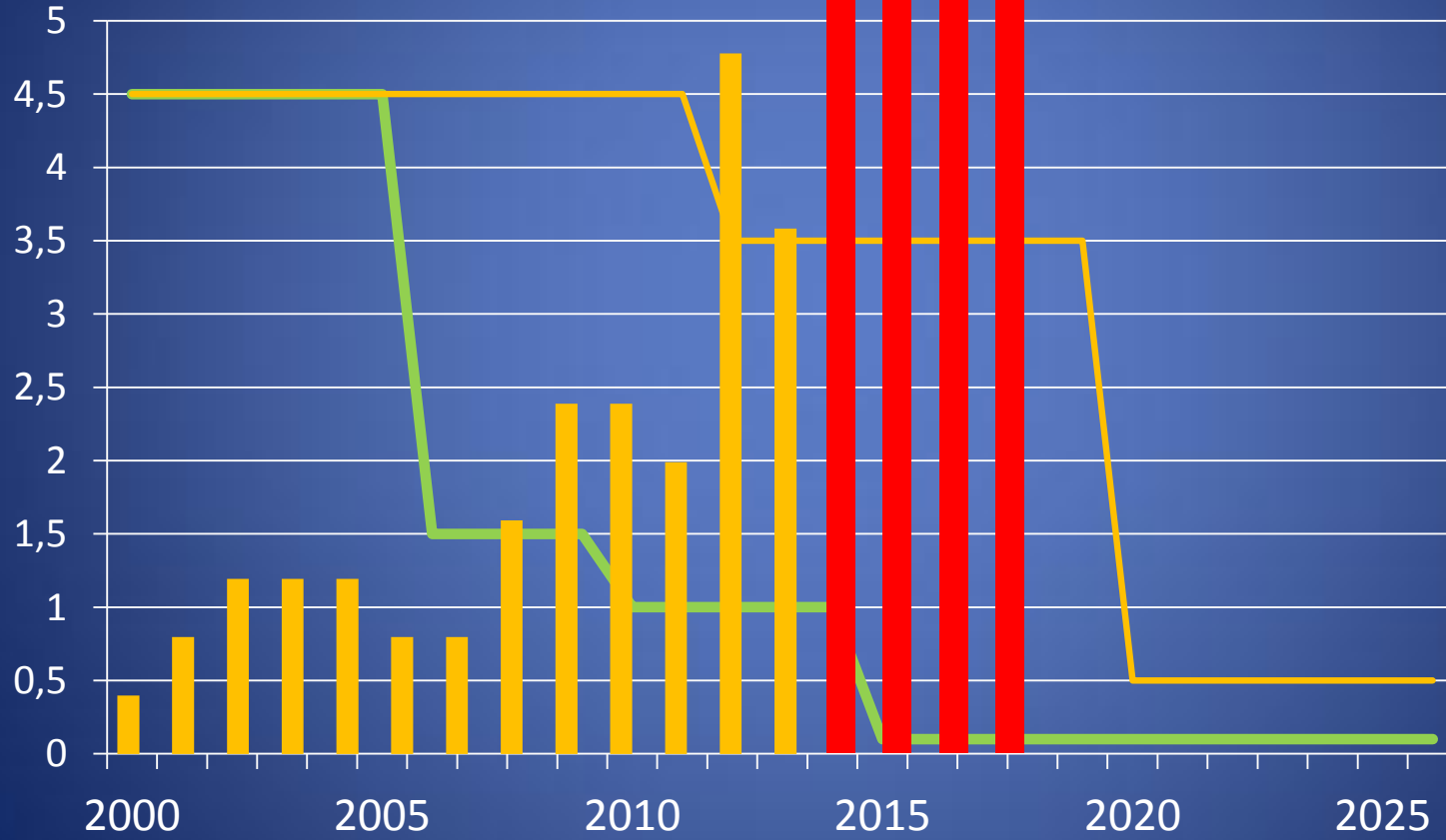
1 % Sulphur in fuel oil at present

In 2015 this is to drop much further to 0.1% Sulphur



September 15-18

A Worrying Trend



The Correlation Between Low Sulphur Legislation and the Increase in Cat Fine Engine Damage Cases.

What do the analysts say ?

The 2012 Global Cap of 3.5% sulphur

- Approx 11% of global HSFO will need to be blended to meet the new limit – yet to be confirmed

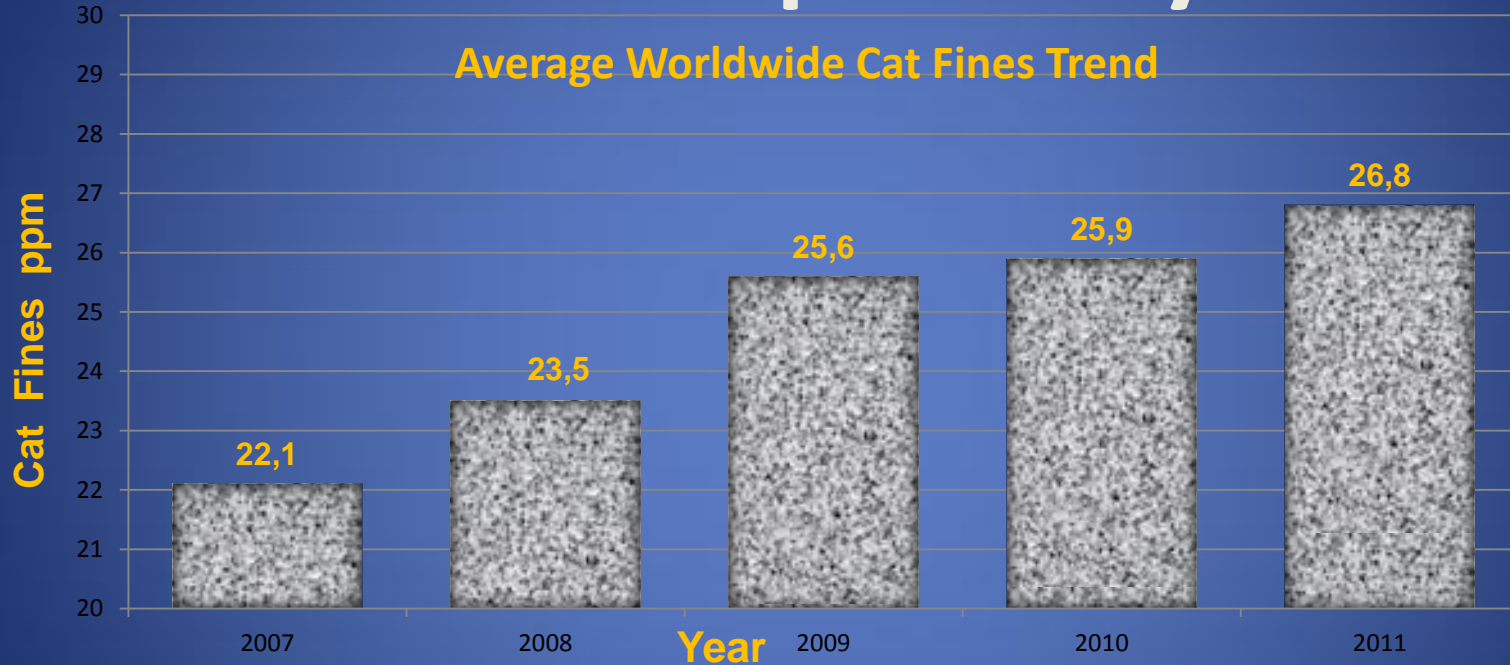
August 2012 – North American ECA in force

- Analysts suggest demand for LSFO will double at the onset of US ECA

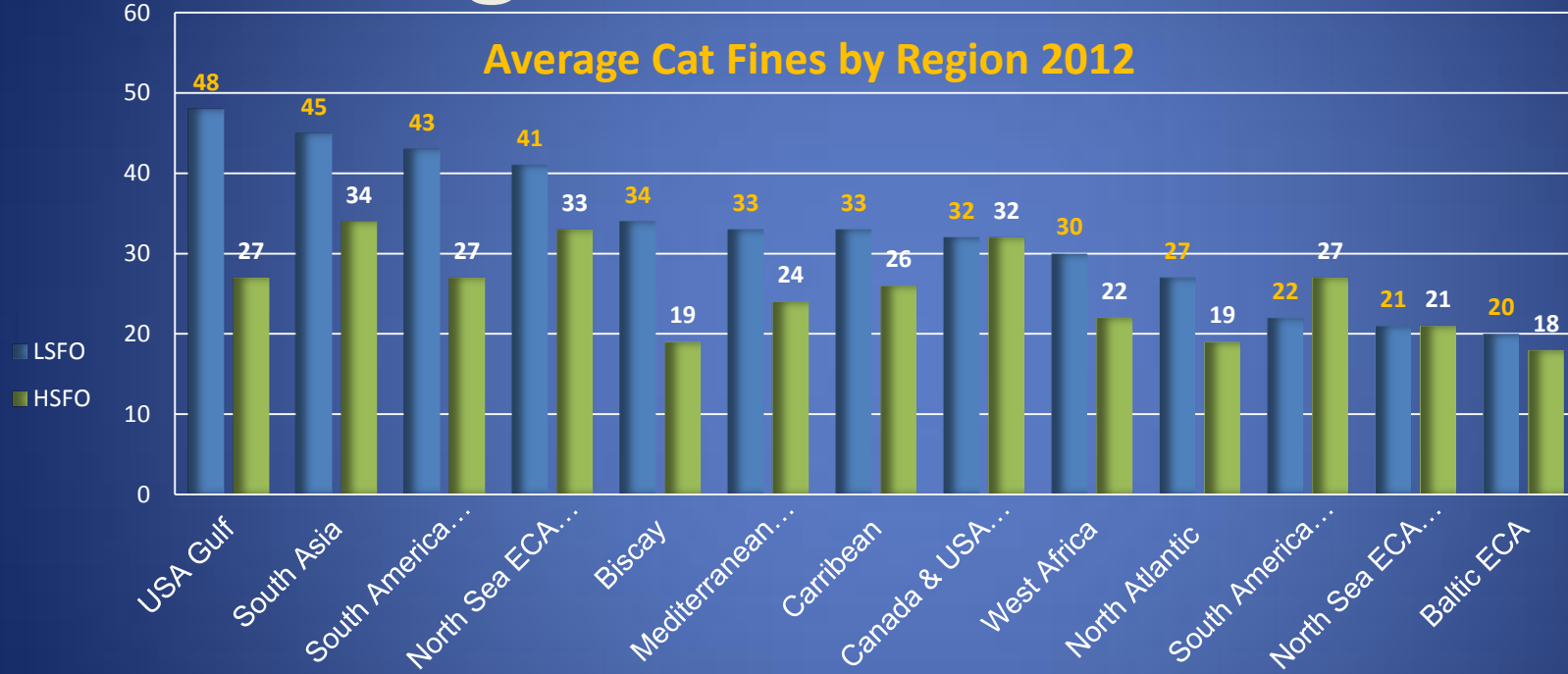
Further more complex blending

Increasing levels of Cat Fines as sulphur levels reduce further

What do the experts say ?



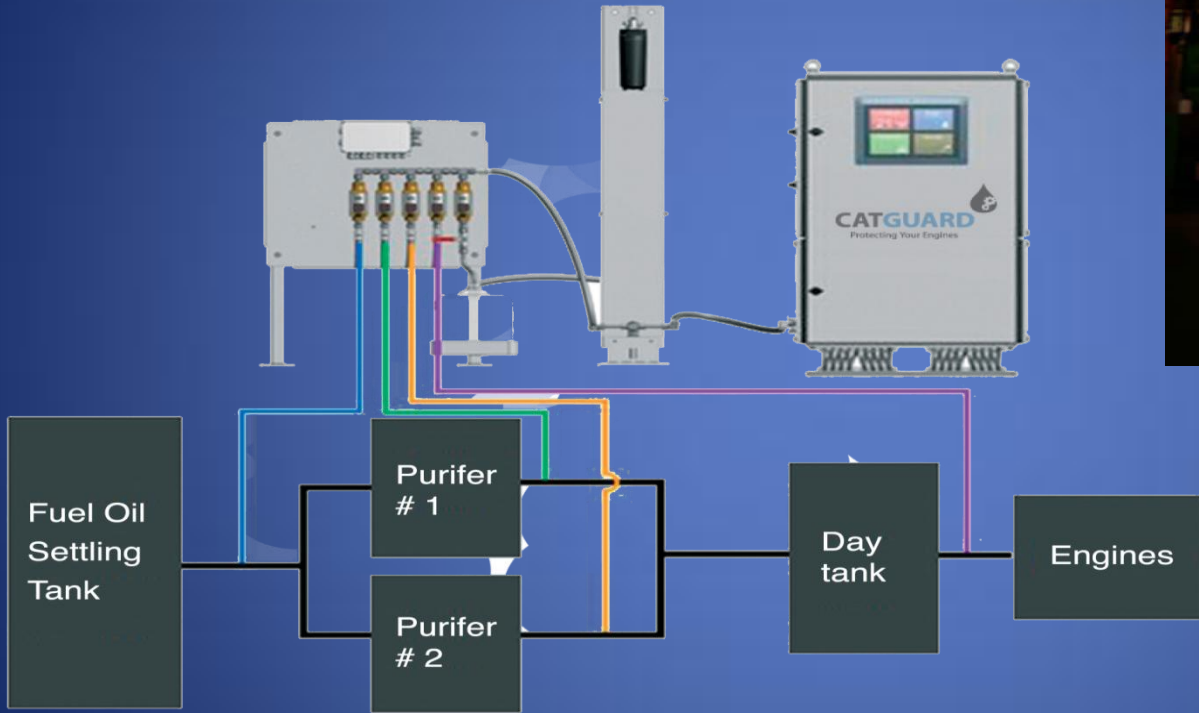
The regional trends?



Who cares about all this anyway?



What can be done?



What is being done?

The International Organisation for Standardization



Since 1982 have published a specification for marine bunker fuels specifying the maximum limits of various characteristic, components and contaminants.

The standard is known as ISO 8217 and is currently in it's fifth revision:

ISO 8217: 2012

More than 15 ppm

➤ Main engine makers specify maximum **15 ppm** catalyst fines

➤ ISO 8217 Standards

1996 (2nd Edition) maximum 80 ppm

2012 (5th Edition) maximum **60 ppm**

Refiners can produce 15ppm fuel oil, but it will cost more

“..anyhow, all ships are built with a fuel treatment system that is capable of removing the cat fines to a level below the 15 ppm stated by engine makers, so what’s the problem”?

The Fuel Cost Issue

- Fuel usually paid for by the TIME charterer
- **If stipulated in c/p 59.99 mg/kg Cat fines is legally “OK”**
- Sampling; representative? reliable analysis?
- Singapore USD/tonne (11 September 2013)
 - HFO 380 Cst = \$ 594 HFO 180 Cst = \$613
 - MDO = \$909 (=50% more expensive than HFO)
- \$700,000 Panamax N.O.- China (save \$120,000-HFO-380)
- Too much fuel storage ties up money/shuts out cargo
- Not enough, or suitable storage tanks
- If they can get away with cheap, off-spec fuel, they will

A Cylinder Liner

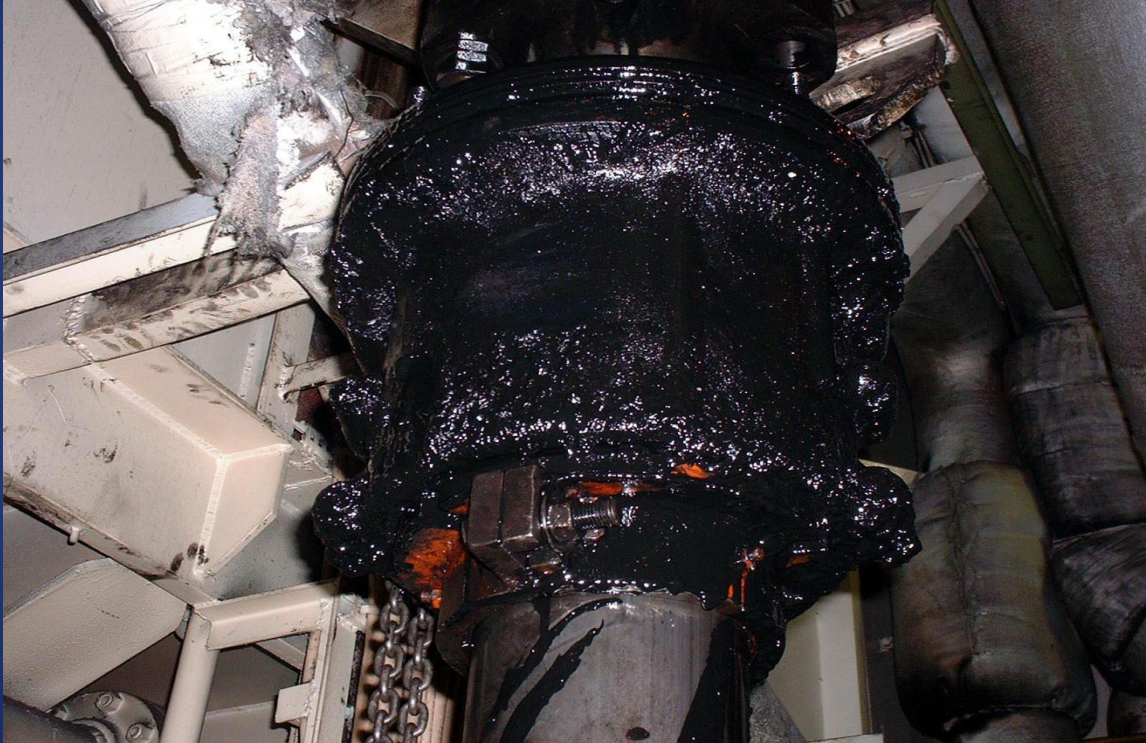


September 15-18

A Purifier



A fuel problem



The Fuel Contract Time Bar

“ Any and all claims arising out or in connection with marine fuel supplied shall be null and void if not submitted in writing by the Buyer to Seller **within 7 days** after the marine fuel has been delivered”



Liability

- **The fuel was supplied within ISO standards**
- **Crew did not get Cat Fines out = “Crew Negligence”**
- **But...**
 - They were unaware they were there/the amount of them, plus
 - Poorly trained
 - Poorly instructed and/or supervised
 - Poorly equipped from the start
 - Equipment poorly maintained
 - Overworked/fatigued
 - Not enough time to do the job
- **Major grounding/pollution – Owner faces criminal sanctions (SOLAS)**
- **“The 2 tugs should be with the casualty in about 9 days”**

Claims – The Legal Bit

- ITC Hulls – Claim presented as
 - Fire Explosion?
 - Latent defect in machinery? (Is fuel “in machinery”)?
 - Crew Negligence – Supervision? Causative? Due diligence?
- Proximate cause? Worn engine parts?
- More than one supply of fuel? How many events?
- Who is the “assured” - who did not tell the crew Cat fines in fuel?
- Defences?
 - Misrepresentation-Non-disclosure?
 - Wilful Misconduct?
 - Wear + Tear?
 - Lack of a Fortuity?
- Underwriters deal with problem?
 - Advise/Questionnaire on fuel management for Assureds?
 - Exclusion/Write Back?
 - Fuel Management Regime Clause/Warranty?

A hearty dog’s breakfast for lawyers

What else is currently being done?

The Joint Hull Committee have recently formed a working group to address the concerns of the Market on the increasing amount of claims due to Cat Fines, Class, Regulatory Bodies and Engine Manufacturers have been consulted in order to provide a satisfactory solution to the problem for everyone.



Lloyd's Market Association

...providing professional, technical support to the Lloyd's underwriting community



u/w + diligent assured



JH 2013/00X

Marine Engine Damage due to Catalytic Fines in Fuel

A Joint Hull Committee paper in conjunction with Braemar (The Salvage Association)



September 2013



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